THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

The opinion in support of the decision being entered today (1) was not written for publication in a law journal and (2) is not binding precedent of the Board.

Paper No. 26

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte HIROSHI GOTO

Appeal No. 95-2948
Application 07/833,664[1]

HEARD: July 17, 1997

Before KRASS, BARRETT, and TORCZON, Administrative Patent Judges.

BARRETT, Administrative Patent Judge.

[1] Application for patent filed February 11, 1992, entitled "Optical Scanner And Bar Code Reader Employing Same," which claims the priority benefit under 35 U.S.C. § 119 of Japanese Application 03-41341, filed February 12, 1991, Japanese Application 03-138307, filed May 13, 1991, and Japanese Application 03-298235, filed October 16, 1991.

DECISION ON APPEAL

This is a decision on appeal under 35 U.S.C. § 134 from the final rejection of claims 1-4 and 18-22, all of the claims pending in the application. Claims 5-13 and 15 are now indicated to be allowable (Examiner's Answer, page 1). Claims 14, 16, and 17 have been cancelled.

The invention is directed to an optical scanner which may be used in a bar code reader.

Claim 1 is reproduced below.

1. An optical scanner comprising:

a light beam source;

a vibrating element having at least two modes of vibration respectively in at least two planes, said vibrating element having respective resonant frequencies associated with each of the modes of vibration which are not integral multiples of each other;

means for driving said vibrating element at substantially its resonant frequency in each of said two modes to cause it to thereby rotate said vibrating element in said at least two planes; and

a scanning surface which receives and reflects a light beam from said source and which moves in association with movement of said vibrating element.

The examiner relies on the following references:

Singh et al. (Singh) 5,132,524 July 21, 1992
(filed May 21, 1990)
Dvorkis et al. (Dvorkis) 5,168,149 December 1, 1992
(filed May 8, 1990)
Bard et al. (Bard) 5,170,277 December 8, 1992
(CIP of an application filed May 13, 1991, which
is a CIP of an application filed May 11, 1988)

Singh discloses a multi-faceted rotating mirror assembly aligned with a plurality of laser output beams to produce a complex set of crossed pair lines as shown in figures 7 and 8 to reduce the chance that a small bar code will not be read.

Figure 4 of Dvorkis teaches a two axis scanner. A U-shaped spring means 110 having a pair of arms 112 and 114 has a scanning component, e.g., a mirror 116, mounted on arm 112 and a permanent magnet 118 mounted on arm 114. An electromagnetic coil 120 is fixed on support 122 and vibrates the scanner through the magnet 118. Arm 114 and magnet 118 are secured to a planar spring 128 mounted on a base. S-shaped leaf spring 134 and spring 142 are part of an alternative embodiment (column 10, lines 12-21), which is not discussed. The coil is driven with a signal that is the superposition of two driving signals, one being in a high frequency range, typically about 200-800 Hz, and the other within a low frequency range, typically about 5-100 Hz. "For example, a 500 Hz square wave signal may be utilized to oscillate component 116 in the x direction and a 10 Hz sine wave signal may be utilized to oscillate component 116 in the y direction" (column 8, lines 48-51). "Preferably, the high frequency signal is frequency tuned to the resonant frequency of the U-shaped spring 110. Typically, the planar spring 128 will be driven below its resonant frequency." Column 8, lines 55-58.

Figures 6a and 6b of Dvorkis show a scanner comprised of reflector 154 mounted to a single planar spring 150 with its center of gravity 166 offset from axis 164 through the spring to provide oscillatory movement in two orthogonal axes for a raster-type scan pattern. A magnet 156 is driven by coil 158 to vibrate the reflector. The coil is driven with a signal that is the superposition of two driving signals, one being in a high frequency range, typically about 50-200 Hz, and the other within a low frequency range, typically about 5-100 Hz. The reflector oscillates at a medium-high frequency, about 50-200 Hz, in the x-z plane (torsional mode) and at a low frequency, about 20-30 Hz, in the x-y plane (bending mode). The scanner structure in figures 6a and 6b of Dvorkis is similar to appellant's scanner in figure 1 except that appellant's drive source is coupled to the end of the deformable shaft opposite the reflector.

Bard discloses a hand held bar code reader which use one or more piezoelectric bimorph elements in the scanning function of the bar code reader optical system. A piezoelectric bimorph element comprises two layers bonded together with a conductive medium with conductive material also on the outside surfaces. When a voltage is applied the device bends and when the voltage is reversed the device bends in the opposite direction (column 6, lines 26-40). Bard states that piezoelectric actuators can operate at high frequencies "but have a technical disadvantage of a very small magnitude of mechanical displacement" (column 2, lines 53-56). "Larger displacements are also possible when the frequency of the drive signal equals the mechanical resonance frequency of the piezoelement" (column 2, line 67 to column 3, line 1). "FIG. 8 depicts a bar code scanning optical system having a pair of sequentially mounted piezoelectric bimorphs, a first bimorph 46 for y deflection and a second bimorph 48, mounted on the first bimorph 46, for x deflection, which drives a scanning mirror 50 for combined x and y deflections of the scanned beam" (column 7, lines 45-50).

Claims 1-4 and 18-22 stand rejected under 35 U.S.C. § 103 as being unpatentable over Singh and Bard or Dvorkis. The examiner's only statement of the rejection is the following (first Office action entered March 29, 1993, Paper No. 6):

> It would have been obvious to one of ordinary skill in the art at the time the invention was made to employ the vibrating scanner component of Bard or Dvorkis with the rotating reflection of Sinch [sic] for the purpose fo [sic] vibrating mirror drive under the rationale of the interchangeability of teachings of similar systems.

OPINION

We affirm-in-part.

The examiner does not explain how Singh is being combined with Dvorkis or Bard. It is not apparent why the artisan would have wanted to substitute the vibrating scanning mirror from Dvorkis or Bard into Singh and it is not clear what Singh adds to Dvorkis or Bard. The Examiner's Answer mentions only Dvorkis and accordingly this decision will focus mainly on Dvorkis which we consider the most relevant reference.

The level of ordinary skill is not argued, so we find the references to be representative of the level of skill in the art. See In re Oelrich, 579 F.2d 86, 91, 198 USPQ 210, 214 (CCPA 1978) ("the PTO usually must evaluate both the scope and content of the prior art and the level of ordinary skill solely on the cold words of the literature"). Cf. Chore-Time Equipment Inc. v. Cumberland Corp., 713 F.2d 774, 779 n.2, 218 USPQ 673, 676 n.2 (Fed. Cir. 1983) ("We hold only that an invention may be held to have been obvious (or nonobvious) without a specific finding of a particular level of skill in the art where, as here, the prior art itself reflects an appropriate level and a need for such expert testimony has not been shown."). Those of ordinary skill in the art must also be presumed to know something about the art apart from what the references expressly disclose. In re Jacoby, 309 F.2d 513, 516, 135 USPQ 317, 319 (CCPA 1962).

Claims 1-4

There are two limitations at issue in claim 1.

First, claim 1 recites "said vibrating element having respective resonant frequencies associated with each of the modes of vibration which are not integral multiples of each other." Dvorkis recites that the vibrating element in figure 4 (the assembly of spring 110 and spring 123) vibrates at 200-800 Hz in the x direction (the resonant frequency of spring 110, column 8, lines 55-57) and 5-100 Hz in the y direction (typically below the resonant frequency of spring 128, column 8, lines 57-58). The vibrating elements are driven at a discrete frequency within the recited ranges, in one example 500 Hz in the x direction and 10 Hz in the y direction (column 8, lines 48-51). Appellant argues that "[f]rom these broad ranges there is no teaching or suggestion that the ratio of resonating frequencies not be integral multiples of each other" (Brief, page 7). It is true that Dvorkis does not state that the resonant frequencies are not integral multiples. However, since the ranges in Dvorkis encompass both integral multiples and non-integral multiples and since it would be mere coincidence if one resonant frequency was an integral multiple of the other, it is considered that the non-integral limitation of claim 1 is suggested by Dvorkis. It would take special effort to design the vibrating elements with resonant frequencies that are integral multiples, and so it is expected that the resonant frequencies are not integral multiples. In the

Dvorkis example of signals of 500 Hz in the x direction and 10 Hz in the y direction, since 10 Hz is below the resonant frequency, the resonant frequency in the y direction would have to be 20, 25, 50, etc. for 500 Hz to be an integral multiple thereof and these few values are less likely compared to all the other values it could have.

Bard does not disclose the resonant frequencies of the vibrating element and there is insufficient information to reason that the resonant frequencies are not integral multiples. Singh does not use a vibrating element and is not relevant to this limitation.

<u>Second</u>, claim 1 recites "means for driving said vibrating element at substantially its resonant frequency in each of said two modes." Dvorkis discloses that in figure 4 only the U-shaped spring 110 is driven at its resonance frequency. "Typically, the planar spring 128 will be driven below its resonance frequency" (column 8, lines 57-58). However, because Dvorkis discloses that the U-shaped spring 110 is driven at its resonance frequency, one skilled in the art would have considered it obvious to likewise drive the planar spring 128 at its resonance frequency. One reason for driving the spring at its resonance frequency that would have been evident to one skilled in the art would be to get larger displacements at the end of the spring for a given input signal. <u>See</u> Bard, column 2, line 67, to column 3, line 1 ("Larger displacements are also possible when the frequency of the drive signal equals the mechanical resonance frequency of the piezoelement.").

Appellant further argues that "the Dvorkis reference does not describe or suggest the <u>specific</u> 'means for driving said vibrating element at substantially its resonant frequency in each of said two modes to cause it to there by [sic, thereby] rotating [sic, rotate] said vibrating element in said at least two planes' as required by In re Donaldson, 29 USPQ2d 1845 (Fed. Cir. 1994)" (Reply Brief, pages 1-2). Appellant does not elaborate on this statement. We find the coil 120 and magnet 118 in Dvorkis to be equivalent under 35 U.S.C. § 112, sixth paragraph, to appellant's disclosed piezoelectric drive source because it is a transducer that coverts electrical signals to mechanical translation and thus performs the same function in substantially the same way to get the same result. It is noted that claim 1 does not recite where the "means for driving" is attached.

For the reasons stated above, we conclude that the subject matter of claim 1 would have been prima facie obvious. The rejection of claim 1 is sustained.

With respect to claims 2-4, these claims define a separation between each harmonic of one resonant frequency of one mode of vibration and the resonant frequency of the other mode of vibration; that is, a range about one of the resonant frequencies into which the harmonic frequencies may not fall. It is much less likely that these limitations will be satisfied by chance by the structure in Dvorkis because it is no longer a matter of whether two points will happen to coincide, but whether a point will lie within a range. The examiner states that the limitations involve a "trivial and obvious parameter variation with prior art range" (Examiner's Answer, page 3). However, besides being the first time the examiner has commented on the limitations, the examiner fails to provide any rationale why the claimed limitations constitute a parameter that one skilled in the art would have sought to vary. The examiner has failed to establish a prima facie case of obviousness. The rejection of claims 2-4 is reversed.

Claims 18-22

Claim 18 does not recite the vibrating element has respective resonant frequencies associated with each of the modes of vibration which are not integral multiples of each other as in claim 1. Claim 18 recites a "deformable shaft" with "a vibrational input unit coupled to one end of said deformable shaft" and "a reflection element coupled to the other end of said shaft." None of the references disclose such a mounting arrangement for the vibrational input unit. Figures 6a and 6b of Dvorkis shows the input unit, the magnet 156 and coil 158, disposed at the same end of the deformable shaft, planar spring 150, as the reflector 154. The examiner provides no reasoning why it would have been obvious to mount the vibrational input unit at the opposite end from the reflector. In Bard, the whole bimorph element bends and thus Bard does not teach mounting the vibrational input unit at the opposite end from the reflector. Again, the examiner provides no reasoning why it would have been obvious to mount the vibrational input unit at the opposite end from the reflector. We agree with the examiner that appellant's argument that "[t]he prior art references fail to disclose or suggest numerous important limitations recited in claim 18" is conclusory. However, inasmuch as the examiner has failed to discuss the limitations of claim 18 in any action and because we find the location of the vibrational input unit not taught by the references we conclude that the examiner has failed to establish a prima facie case of obviousness. The rejection of claims 18-22 is reversed.

CONCLUSION

The rejection of claim 1 is sustained.

The rejection of claims 2-4 and 18-22 is reversed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a).

AFFIRMED-IN-PART

ERROL A. KRASS)
Administrative Patent Judge)
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